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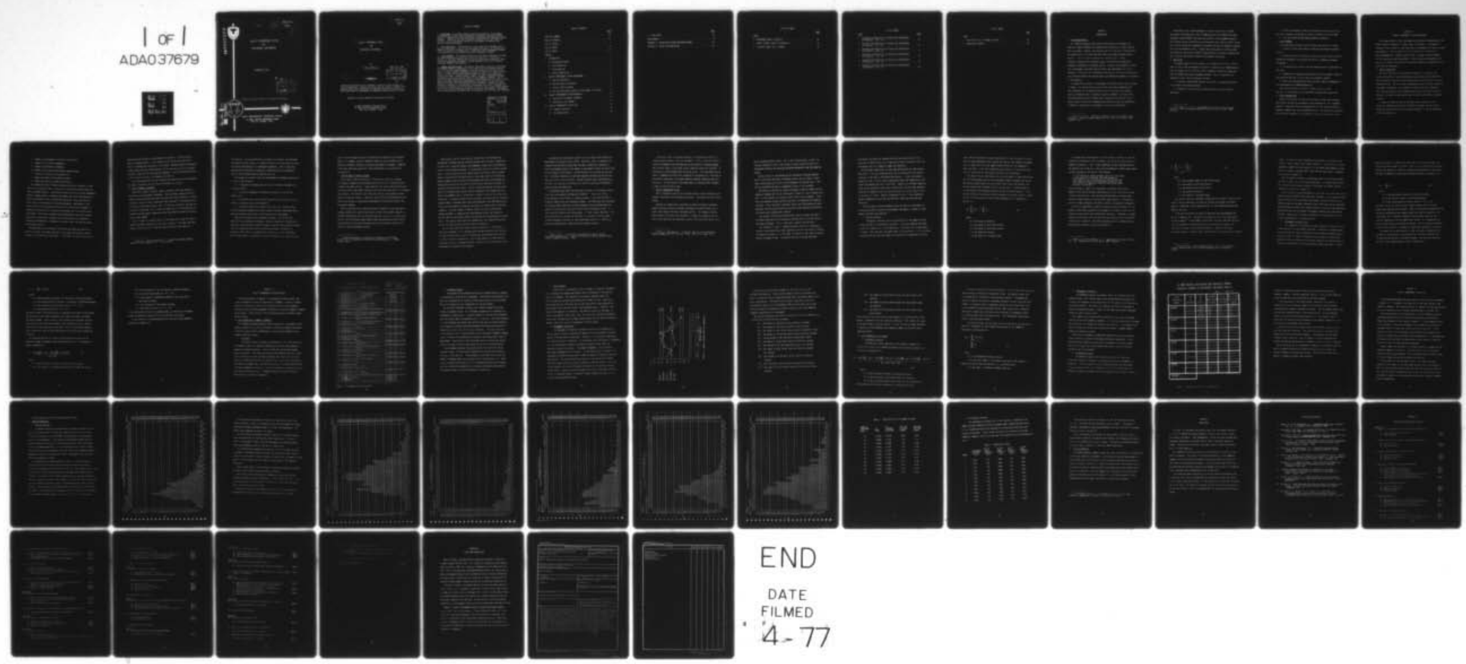

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QUALITY IMPROVEMENT SYSTEM
FOR
PROCUREMENT INSTRUMENTS

FEBRUARY 1977

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ARMY PROCUREMENT RESEARCH OFFICE
U.S. ARMY LOGISTICS MANAGEMENT CENTER
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QUALITY IMPROVEMENT SYSTEM FOR PROCUREMENT INSTRUMENTS.

by

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EXECUTIVE SUMMARY

1. BACKGROUND. A reliable system to control the quality of procurement instruments and provide useful management information regarding document quality is needed within the Army Materiel Development and Readiness Command (DARCOM). Therefore, the Army Procurement Research Office was tasked to develop a quality improvement system for procurement instruments that satisfies both requirements.

2. STUDY OBJECTIVES. The objectives of this study are to develop and to test a system that (i) aids in the improvement and control of the quality of DARCOM procurement instruments and (ii) provides useful management information compatible with the DARCOM procurement management program.

3. STUDY APPROACH. The approach taken to achieve these objectives includes the identification and evaluation of quality indicators, a review and analysis of existing software quality control systems and techniques, interviews with procurement personnel, and the synthesis and test of a system that meets DARCOM's requirements.

4. SUMMARY AND CONCLUSIONS. The Quality Improvement System for Procurement Instruments (QISPI) as presented in this report has considerable potential as a tool for procurement managers to control the quality of their instruments. Document quality measurement and control begins with a quality indicator (QI) calculation based upon the number and type of instrument deficiencies per page. Standard control charts are used to determine document acceptability and track quality levels at the commodity commands. The QI values from each command are adjusted at the HQ DARCOM level to reflect review board proficiency and sampling percentages which results in the final performance indicator (PI) calculation for all of DARCOM. System test results from tests conducted at selected major procurement activities of DARCOM will be carefully evaluated during and after the test to confirm the appropriateness and utility of the system and to make any necessary improvements. Recommendations regarding QISPI implementation are postponed until the tests are completed.

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CHAPTER I

INTRODUCTION

A. BACKGROUND/PROBLEM

All commodity commands within the US Army Materiel Development and Readiness Command (DARCOM) are concerned with the quality of their procurement instruments. However, none really knows just how good or how bad their instruments are; nor do they know what their procurement document quality trend is. This is primarily because the commands have no formal standard to measure their documents against and therefore no meaningful management information on document quality. Without such management information, procurement instrument quality control and improvement are at best haphazard. The lack of the information also makes it difficult to state with any confidence whether the present quality of DARCOM procurements is acceptable or unacceptable.

To remedy this situation a procurement instrument quality control system is needed. The system would not only assure procurement management that their documents are of acceptable quality but also provide the document quality information that is presently lacking in DARCOM. A previous Army Procurement Research Office (APRO) report recognized the need for such a quality control system and recommended that one be designed and implemented in DARCOM in conjunction with permanent, full-time review boards.[1]

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[1]Nick, R. W. et al. "Analysis of AMC Solicitation and Award Review Procedures." Army Procurement Research Office, Fort Lee, Virginia 23801. September 1975.

Additionally, any system developed to improve the quality of DARCOM procurement instruments must also be compatible with the DARCOM Procurement Management System (PROMS) that plans and controls its procurement program.[2] The document quality information to be provided by this quality control system must satisfy procurement management requirements at both the commodity command level and the DARCOM HQ level. To meet these requirements, the Procurement and Production Directorate, DARCOM, tasked APRO with a project to develop and test a quality improvement system for procurement instruments.

B. OBJECTIVES

The general objective of the project is to develop and to test a system that (i) aids in the improvement and control of the quality of DARCOM procurement instruments and (ii) provides useful management information compatible with the DARCOM procurement management program. Specific objectives encompassed by this two-fold objective include:

1. Establish a measurement baseline or criteria as to what constitutes an acceptable procurement document.

2. Synthesize a system using available statistical quality control techniques.

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[2] Williams, R. F. et. al. "Procurement Goal Setting and Performance Analysis." Army Procurement Research Office, Fort Lee, Virginia 23801. July 1975.

3. Define a performance index for procurement document quality and the tasks, targets, and methods of analysis required as input to PROMS.

4. Test the system and make modifications as required.

C. STUDY APPROACH

To achieve these objectives the following study approach is taken:

1. Identify factors that affect or indicate procurement instrument quality.

2. Review and analyze literature on existing software quality control systems and techniques for possible application to DARCOM procurement instruments.

3. Interview quality control and procurement personnel experienced in this area.

4. Synthesize a proposed system that meets the requirements stated in the objectives and test it at at least one commodity command.

5. After any required modifications are made, submit recommendations for implementation to DARCOM Headquarters.

This report presents the results of APRO's research effort thus far. A final report will be published following the system tests.

D. REPORT ORGANIZATION

Chapter II discusses existing quality control systems and techniques and presents the quality improvement system developed for use in DARCOM. Chapter III describes the envisioned operation of the system at both the commodity command level and the DARCOM HQ level. Two system test approaches are discussed in Chapter IV, and Chapter V briefly concludes this report.

CHAPTER II

QUALITY IMPROVEMENT SYSTEM DEVELOPMENT

The primary mission of the Procurement and Production Directorates at the DARCOM commodity commands is to make "good" procurements. A fundamental assumption of this report is that high quality instruments will result in good procurements; if the instrument quality is controlled, the quality of the procurements will likewise be controlled. Although a good instrument will not guarantee a good procurement, it does increase the probability of one since it reflects the quality of the effort expended in planning for and executing the procurement.

A. QUALITY INDICATORS

The basic function of a procurement instrument is to legally, and within the confines of established general procurement policy, obtain the required goods or services at the required time and place and at a fair and reasonable price. The first step in developing a quality control system for procurement instruments is to establish a quality indicator, something that indicates how well the instrument satisfies this function. Once the indicator is chosen, an appropriate quality control system can be designed around it.

A number of potential quality indicators were considered in the search for something that directly reflected instrument quality and was measurable and controllable by procurement personnel. They are summarized in the following list:

1. Number of procurement solicitation cancellations.
2. Number of solicitation amendments.
3. Number of supplemental agreements.
4. Number of bid protests and contract appeals upheld.
5. Customer satisfaction with good/service.
6. Number and length of procurement reviews.
7. Number and type of instrument deficiencies.

The problem with most of these variables as quality indicators is that they are not reliable; that is, they do not consistently and accurately reflect instrument quality. Since difficulties such as solicitation amendments, contract change orders, or protests and appeals can result from good documents and through no fault of procurement personnel, these variables are useful only as rough measures of good procurements. Additionally, such difficulties will not necessarily follow from a low quality instrument. A competent contractor with a low quality instrument can still yield a good procurement. Unlike most hardware quality measurements which are accurate and precise, procurement instrument quality measurements are inherently subjective and imprecise. Therefore, no direct, exact indicator was found for document quality.

Although none of the variables listed really met what was desired in a quality indicator, the number and type of instrument deficiencies came the closest to satisfying the requirements. The number and type of deficiencies

detected during review by a procurement review board is a direct measurement of document quality. It is reliable to the extent that the review board is thorough and consistent in its review. Document quality as measured by the number and type of deficiencies can be controlled by the procurement personnel preparing and reviewing the documents. A more detailed discussion of this quality indicator is presented in Section D.

After the appropriate quality indicator was established, an investigation was made of available quality control techniques and systems.

B. QUALITY CONTROL TECHNIQUES

There are a number of quality control techniques that have potential application to procurement instruments. Rating schemes ranging from color coding to letter grading have been tried and offer some usefulness. Various statistical quality control techniques offer assurance of the desired level of quality at the lowest overall cost. Of the many techniques examined, two statistical techniques, the "C" chart for defects per unit and sampling for inspection by attributes, appeared to have the greatest potential for application within DARCOM.

The "C" chart is a control chart for attributes that shows the count of defects following inspection of the item of concern.[3] The upper and lower control limits for the "C" chart are based on the Poisson probability

[3] Grant, E. L. and Leavenworth, R. S. Statistical Quality Control, McGraw-Hill Book Company, 1972. Fourth Edition.

distribution. Since opportunities for defects are numerous in procurement instruments but the chances of a defect occuring in any one place are small, the Poisson distribution is a reasonable assumption. The "C" chart has application to 100 percent inspection or sampling and can be adapted to quality rating schemes based on demerits per unit.

The purpose of a control chart for procurement instruments would be one or more of the following:

1. To discover the average quality level of documents reviewed over a period of time.

2. To bring to management's attention any changes in the average quality level.

3. To discover those out-of-control high points that require action to identify and correct causes of bad quality.

4. To discover those out-of-control low points that indicate either relaxed inspection standards or erratic causes of quality improvement which might be converted into causes of consistent quality improvement.

Sampling for inspection by attributes is another statistical tool applicable to procurement instruments. Briefly, sampling for inspection by attributes involves taking a portion (sample) from the total product available (lot) and inspecting that portion (counting the number of defects) to determine if the total is acceptable with respect to a given requirement. MIL-STD-105D, which is referred to in most government product specifications,

gives a more thorough discussion of sampling for inspection by attributes.[4] While it is normally used for hardware inspection, the principles can be applied to software inspection including procurement instruments. Sampling plans other than those specified in MIL-STD-105D are also available for consideration.

C. PRESENT QUALITY CONTROL SYSTEMS

While none of these techniques is currently being applied in DARCOM, all commodity commands have developed checklists to aid in controlling procurement instrument quality. These checklists are used by the procuring contracting officer (PCO) when he prepares the action to assure that it is complete and accurate. The checklists are similarly used by a procurement reviewer when he reviews the actions. Checklists have a definite shortcoming in that they do not provide a quantitative measurement of the quality level of the procurement package.

Most of the activities contacted outside of DARCOM also use some type of document checklist to control the quality of their procurements; however, a few DOD organizations have included the checklist as part of a larger system. The Air Force and Defense Supply Agency have both developed quality control systems based on statistical techniques and are using them to control the quality of their procurement actions.

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[4] "Sampling Procedures and Tables for Inspection by Attributes," MIL-STD-105D, US Government Printing Office, Washington, D.C. 20402, 29 April 1963.

Specifically, one Air Force Logistic Center (ALC) has developed and implemented a document quality assurance program that includes a combination of checklists, inspection sheets, and judgmental inspection of non-checklist items in the procurement package. A review board records the defects (either major or minor) found during the review process and returns these recorded defects along with the reviewed actions to the buyer and PCO for follow-up. Monthly summaries that show quality performance and trends are prepared for each buying division and are given to the division management for their information and corrective action. The ALC reviews 100 percent of the actions equal to or greater than specific dollar thresholds, which depend upon the type of procurement, but it reviews only a sample of actions less than these thresholds. A sampling system called Procurement Integrated Quality Assurance System (PIQAS) is employed which uses the techniques in MIL-STD-105D to provide a practical means of assessing the quality of smaller dollar value procurements. The total number of defects found during the review of the sampled documents is compared with the acceptance number (Ac) stated in MIL-STD-105D for the present sample size and desired Acceptable Quality Level (AQL). The results, which show lot acceptability, are summarized quarterly and sent to each buying division for their information.

The ALC feels that their overall quality program (1) is effective in identifying problems, (2) is operated with optimum expenditure of resources for the desired results, and (3) indicates that procurement action quality is within limits of acceptability. The claimed benefits include improved procurement quality, informed personnel, a practical training vehicle, and a measurement of personnel effectiveness.

A second ALC has developed a system similar to PIQAS called Program for Improvement of Contract Actions (PICA). Basically, PICA is a sampling for inspection by attributes system that includes a statistical analysis of quality performance based on the number of procurement actions and error rate for each sample stratification. Stratifications are by buying section and PCO. Confidence statements can be made regarding document quality and the source of error can be pinpointed. Another approach under consideration at this ALC is to use the F-distribution to test for significant differences among sections and among PCOs.

The Defense Supply Agency has developed a System for Procurement Evaluation, Quality Assessment and Reporting (SPEAR).[5] Similar to the Air Force systems in that SPEAR is a sampling system, it uses MIL-STD-105D to determine sample sizes and acceptance numbers. The SPEAR uses small purchase and large purchase checklists to guide document review and determines the sample size according to the dollar value of the procurement action. It also classifies defects into three groups: critical, major, and minor. The percent defective or defects per 100 units is calculated from the sample as the performance indicator for each procurement action lot. Monthly reports are prepared which summarize the performance achieved.

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[5] Gorski, W. B. "A System for Procurement Evaluation, Quality Assessment and Reporting." Contract Review Office, Defense General Supply Center, Richmond, Virginia. 1970.

The quality index for drawing packages, a non-government system for software quality control, was also reviewed.[6] In this system the number of errors are counted on each drawing during the review of a drawing package and a quality index is calculated using a negative exponential function. A distinction is made between major and minor errors. The calculated quality index is compared with historical standards for acceptability. Provision is also made in the system for package sampling, package complexity and error correction. A final quality index measurement is obtained after allowance is made for each of these items.

D. QUALITY IMPROVEMENT SYSTEM

After a thorough review of the available quality control techniques and systems, the control chart approach was chosen. The reasons for this choice follow.

Sampling for inspection by attributes provides information regarding general quality and which instrument attributes are problem areas, but it shows little about individual instrument quality. For example, assuming each checklist line item is an attribute, a review of a sample of 10 contracts might show only one deficiency in each line item which overall could

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[6] Sargon, V. and Murphy, J. "A Quality Index for Drawing Packages," Graphic Science, New York, New York 10016. March 1971, pages 16-21.

be an acceptable quality level. But if that one deficiency in each line item was contained in one or two contracts, those contracts would be of unacceptable quality but would be considered acceptable under the sampling system.

Control charts for attributes provide information regarding general quality levels and individual instrument quality, but by itself, a chart shows nothing about which areas of the documents are problem areas. That must be determined through an independent review of the documents.

Additionally, large dollar volume instruments cannot be sampled by the commodity commands but must be 100 percent reviewed, at least to begin with, and it is not feasible to review all small dollar value documents. Therefore, two separate systems would be required to accommodate this sampling situation. Since individual instrument quality was considered to be more important than attribute quality and only one simple approach was desired, the control chart approach was selected.

The system structure was constructed by using the number and type of instrument deficiencies as the quality indicator and the control chart as the general approach. The "C" chart was a logical starting point.

The standard "C" chart is appropriate where articles or subgroups of articles have substantially equal opportunity for the occurrence of defects. The measured variable, C, is the number of defects or deficiencies observed during instrument review. It might be possible to assume that each

procurement instrument has substantially the same opportunity for the occurrence of deficiencies, but it would be a liberal assumption since the instruments vary so in number of pages and complexity.

An additional complication is that some deficiencies are more serious than others. This was recognized early and is considered by the quality indicator in the type of instrument deficiencies. It does not present a problem for the "C" chart since an adaptation based upon demerits per unit rather than defects per unit is available. Demerits of different numerical value can be assigned to each class of deficiency, and the total weighted deficiencies (demerits) per unit can be plotted on a control chart just as in the basic "C" chart. However, acceptance of the "C" chart adaptation based on demerits per unit was reserved until other possibilities were exhausted.

Since no other existing technique suited the specific requirements of this quality control system for procurement instruments, a return to fundamental statistics was necessary.

1. Quality Indicator

The quality indicator (QI) to be controlled is the number and type of deficiencies in a procurement instrument. Since the complete instrument varies so in number of pages and complexity, a different unit of measurement is needed. The individual instrument page is an alternative. It is reasonable to assume that the individual pages are statistically independent from each

other and have substantially equal opportunity for the occurrence of errors. This is "more reasonable" than assuming the same for the complete instrument. Also, to begin with, only two types of deficiencies will be recognized - major and minor. Using this assumption and deficiency classification, the specific expression for the quality indicator can be developed.

The number of major deficiencies (A), and the number of minor deficiencies (B), on each document page are two independent random variables that can be described by some probability distribution (most likely the Poisson), but the distribution may not matter as will be seen later. A third factor, C, is introduced as the weighting constant for the major deficiencies. If all the deficiencies on each page of the instrument are totaled, the QI is simply the sum of the B values plus the A values weighted by C as expressed in equation (1).

$$QI = \sum_{i=1}^{n} B_i + C \cdot \sum_{i-1}^{n} A_i \qquad (1)$$

where:

QI is the quality indicator,

A is the number of major deficiencies,

B is the number of minor deficiencies,

C is the weighting constant,

n is the number of instrument pages.

A problem with using equation (1) as the quality indicator is that the probability distribution of QI is unknown; this would not allow the use of parametric statistics. But, if both summations on the right-hand side of the equation are divided by n, the resulting summation of means tends toward normality because of the central limit theorem.

> "If the individual random variables going into the sample are not normally distributed, but their number is sufficiently large, then the central limit theorem indicates that the sample mean tends toward normality, and the distribution theory for normally distributed random variables is relevant."[7]

Since the number of pages in a procurement instrument usually falls between 30 and 100 and averages approximately 60, the "sufficiently large" criterion should be met. Also the expected deficiency occurrence rate should be large enough to allow the normal approximation. A further discussion of these assumptions and their validity is presented in Chapter IV.

The sum of independent, normally distributed random variables is also normally distributed regardless of the number of variables in the sum, and constants do not affect the distribution's normality. Therefore, a further breakout of deficiency type into more than two classifications is possible in the future if desired. The resulting expression for a normally distributed quality indicator is given in equation (2).

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[7] Bowker, A. H. and Lieberman, G. J. Engineering Statistics, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1959. Page 66.

$$QI = \frac{\sum_{i=1}^{n} B_i + C \cdot \sum_{i=1}^{n} A_i}{n} \qquad (2)$$

where:

QI is the weighted number of deficiencies/page,

B is the number of minor deficiencies,

A is the number of major deficiencies,

C is the weighting constant,

n is the number of instrument pages.

This quality indicator expressed in deficiencies per page is theoretically correct, easily understood, and directly reflects procurement instrument quality. Therefore, it was chosen over the "C" chart adaptation based upon demerits per unit.

It may not be necessary to resort to distributional approximation for the QI in equation (2). The exact distribution of this QI was determined to be chi-square.[8] If the number of occurrences of major and minor deficiencies on any page are assumed to each follow a Poisson distribution, the resultant QI follows a chi-square distribution. Therefore, the exact percentage points for control limits can be readily calculated using chi-square

[8] Solomon, Herbert. Unpublished memo dated 1 Sep 76 from Professor Solomon, Stanford University, to APRO regarding this distributional problem.

tables. As the deficiency parameter and the number of instrument pages increase, the chi-square tends toward normality. The decision as to which approach is better for this system; i.e., the normal approximation or the exact chi-square, is delayed until after the test application is complete as discussed in Chapter IV.

Once the quality indicator is established and its distribution known, the control chart can be structured accordingly. An example control chart for the Quality Improvement System for Procurement Instruments (QISPI) is presented in Figure 2 of Chapter III.

Up to this point in the development of the QISPI, only those deficiencies detected during document review have been considered. But to determine the overall quality of the procurement instruments, the deficiencies that go undetected during instrument preparation and review must also be considered. The performance indicator (PI) concept accounts for not only the undetected deficiencies but also the number of documents sampled versus 100 percent reviewed. Whereas the QI values are measures of incoming quality, the PI values become measures of outgoing quality.

2. Performance Indicator (PI).

It is impractical to attempt to remove through inspection all errors or deficiencies in a procurement instrument. Therefore, an unknown number of deficiencies will remain undetected in each document throughout preparation and review. In order to estimate the total number of deficiencies remaining in the instrument from the number detected, consideration must be given to the proficiency of the review board in detecting errors. Review

board proficiency is a function of many factors including instrument complexity and time allowed for review. Since it is not possible to accurately quantify and consider all factors, a simple scale adjustment to the quality indicator is made which yields the performance indicator in equation (3).

$$PI = \frac{QI}{PF} - QI \qquad (3)$$

where:

PI is the performance indicator in deficiencies/page,

QI is the quality indicator in deficiencies/page,

PF is the review board proficiency factor ($0 < PF \leq 1.0$).

A PF equal to one is unlikely since it would indicate that all errors present were detected and corrected. Since all deficiencies detected during review are corrected by the preparer before solicitation issuance or contract award, this PI becomes a measure of the weighted number of deficiencies remaining in the instrument after review. It is appropriate for those documents that are reviewed 100 percent. For that group of documents of which only a portion is reviewed, an additional adjustment is necessary.

To account for the deficiencies in those instruments prepared but not reviewed, a second factor is introduced called the sampling factor (SF). SF indicates the percent of the group reviewed. The resultant expression for the PI for a sampled group is given in equation (4).

$$PI = \frac{QI}{PF} - (QI)(SF) \tag{4}$$

where:

PI is the performance indicator for the group in deficiencies/page,

QI is the average quality indicator of the sample in deficiencies/page,

PF is the review board proficiency factor ($0 < PF \leq 1.0$),

SF is the sampling factor ($0 < SF \leq 1.0$).

The quality level of the entire group is estimated to be equal to the average quality level of the sample; therefore, the larger the sample, the better the group estimate. An SF of zero is not allowed since that would indicate zero percent of the group was reviewed, and an estimate based on a sample size of zero is not statistically possible. An SF of one reduces equation (4) to equation (3) and indicates 100 percent of the group was reviewed and corrected.

By combining equations (3) and (4) and weighting each factor by the applicable number of documents, the final expression for PI is obtained as shown in equation (5).

$$PI = \frac{(NLI)(\frac{QIL}{PF} - QIL) + (NSI)(\frac{QIS}{PF} - (QIS)(SF))}{NLI + NSI} \tag{5}$$

where:

PI is the performance indicator in deficiencies per page,

NLI is the number of instruments prepared and reviewed 100 percent,

QIL is the average QI of the 100 percent reviewed instruments,

PF is the proficiency factor ($0 < PF \leq 1.0$),

NSI is the number of instruments prepared in the group which was sample reviewed,

QIS is the average QI of the sample reviewed,

SF is the sampling factor ($0 < SF \leq 1.0$).

If the proficiency factors vary between groups, or additional instrument groups are necessary, equation (5) can be adjusted accordingly.

A description of the planned operation of the QISPI within DARCOM is presented in Chapter III.

CHAPTER III

QUALITY IMPROVEMENT SYSTEM OPERATION

The QISPI discussed in Chapter II is presented in general terms, but it was developed for a specific application in DARCOM. A system is needed that aids in the quality control of solicitation and contract documents and provides the required management information at both the commodity command and HQ levels. A description of the envisioned operation of QISPI at both levels follows.

A. QISPI OPERATION AT COMMODITY COMMANDS

All commodity commands presently employ some type of procurement review board and checklist to control the quality of their procurement instruments. To maximize ease of QISPI implementation, the existing procedures are retained as much as possible.

1. Checklist

The present checklist concept is retained, but the actual checklists are changed so that all commodity commands are using the same standard to gauge their documents against. Figure 1 shows the standard procurement quality checklist. The responsible buyer or PCO completes the first column of the checklist for every instrument prepared over $10,000 in value and places it in the contract file for future review. Even if the instrument is not formally reviewed later, the checklist serves as a valuable guide during instrument preparation, because it covers all substantive items and considers both form and content errors. A companion breakout of major and minor deficiencies is provided in Appendix A.

PROCUREMENT QUALITY CHECKLIST			Annotated Elements Are Correct			
			Contracting Specialist/ Officer		Reviewing Official NO (Error Type & Number)	
Contract/Solicitation No.	Modification/Amendment No.	PR/Project No.	YES	N/A	MAJOR	MINOR

Item	YES	N/A	MAJOR	MINOR
SECTION A				
1. Type of Contract, Modification, Solicitation, Amendment, & Codes	XXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXX
2. Contract, Modification, Solicitation, Amendment Numbers		XXXXXXXX		
3. Issuing, Administrative and Paying Offices and Codes		XXXXXXXX		
4. Delivery Discount, and Invoice Information		XXXXXXXX		
5. Contractor Name, Address and Code				
6. Ship to/Mark for and Codes		XXXXXXXX		
7. Accounting and Appropriation Data, certified and available				
8. Contract/Modification Amount, Prices and Justification				
9. Negotiation Authority, Included and Appropriate				
10. All Other Section A Elements e.g. Sole Source, SB Review, DO Rating, etc.				
SECTION B	XXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXX
11. Government Contract/Solicitation Forms included with appropriate date, etc.				
12. Contractor's Representations, Certifications and Statements completed				
SECTION C				
13. Instructions, Conditions and Notices included and appropriate				
SECTION D	XXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXX
14. Evaluation Factors, e.g. Discount, Gov't Property, Transportation, etc.				
15. Factors Other Than Price and Relative Order of Importance				
16. All Other Section D Elements				
SECTION E	XXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXX
17. Line and Subline Item Nos./NSN/Part Nos.				
18. Nouns and Quantities				
19. All Other Section E Elements				
SECTION F	XXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXX
20. Description and Specification, Including Revisions and Dates				
21. Brand Name or Equal Statement				
22. All Other Section F Elements				
SECTION G	XXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXX
23. Preservation, Packaging, Packing and Marking				
SECTION H	XXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXX
24. Delivery or Performance Dates and Place and Method of delivery				
SECTION I				
25. Inspection and Acceptance Requirements				
26. All Other Section I Elements				
SECTION J	XXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXX
27. Special Provisions, e.g. Option, Warranties, First Article, etc.				
SECTION K	XXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXX
28. Paying and ACO Instructions Including PCO Information				
29. All Other Section K Elements				
SECTION L	XXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXX
30. Required General Provisions				
31. Additional Applicable General Provisions				
32. Appropriate Alterations to General Provisions				
SECTION M	XXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXX
33. List of All Documents, Exhibits, Attachments				
34. Forms, Numbers, Names, Dates, and Number of Pages				
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	XXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXX
35. TOTAL NUMBER OF DEFICIENCIES	XXXXXXX	XXXXXXXX		
36. TOTAL NUMBER OF DOCUMENT PAGES	XXXXXXX	XXXXXXXX		
37. QUALITY INDICATOR (QI)	XXXXXXX	XXXXXXXX		

Contract Specialist (Signature & Date)	Contracting Officer (Signature & Date)	Reviewing Official (Sig. & Date)

FIGURE 1. Procurement Quality Checklist.

2. Instrument Review

The present dollar threshold that must be reached before a document is reviewed by a formal board is $100,000. Solicitations and contracts less than this threshold do not receive a formal board review but are reviewed only by the buying activity responsible for the procurement.

For the QISPI $100,000 is used as the threshold between 100 percent review and sampled review. All instruments exceeding this threshold are reviewed by a formal board. It may be feasible to increase this threshold once the quality level is determined and is in control. For those documents less than $100,000 but greater than $10,000 (the small purchase threshold), a percentage are randomly selected throughout the reporting period and reviewed just as the large dollar value instruments. The exact percentage to be sampled is left to the discretion of the individual commodity commands since it involves the expenditure of resources and affects their final PI measurement. The results of this review are used to estimate the quality level of the smaller dollar value group for any given reporting period.

A board member completes the second column of the checklist during document review. All deficiencies detected are recorded and narrated on the back of the checklist. A board member or assistant then records the number of document pages and calculates the QI using equation (2). After a copy is made of the checklist, it is returned along with the instrument and file to the PCO responsible for correcting the detected deficiencies. The checklist copy is filed by the board for future use.

3. Control Charts.

Once the QI is calculated, for an instrument or group of instruments, it is plotted on an appropriate control chart to determine if the quality level is acceptable. One approach is to maintain separate charts for solicitations and contracts and record two variables on each. Each chart would show both the individual QIs for the large dollar value document and the average QI for the small dollar value document groups. Figure 2 illustrates this approach for contracts. The specific values for the means, U_L and U_S, and control limits, UCL_L, UCL_S, LCL_L and LCL_S, should be determined from actual instrument quality data using standard quality control procedures. Control limits will vary for instruments of varying pages.

4. Management Information.

The management information available from the QI calculations and control charts includes a quantitative measure of the procurement instrument quality level and quality trend data. From this it is possible to determine if corrective action is necessary. If the quality level and trend is acceptable; i.e., no out-of-control points or steadily increasing trend lines, no corrective action is necessary. Procurement management can be confident that their instruments are in control. If the quality level or trend is not acceptable, corrective action must be taken to remove the causes of unacceptable quality. The out-of-control high points or low points are reliable indicators where corrective action is necessary, and the specific line items on the checklist for an out-of-control instrument can be used to pin-point problem areas. Corrective action includes such items as personnel training, policy or procedure changes, increased allowable preparation time, or, as a last resort, personnel actions.

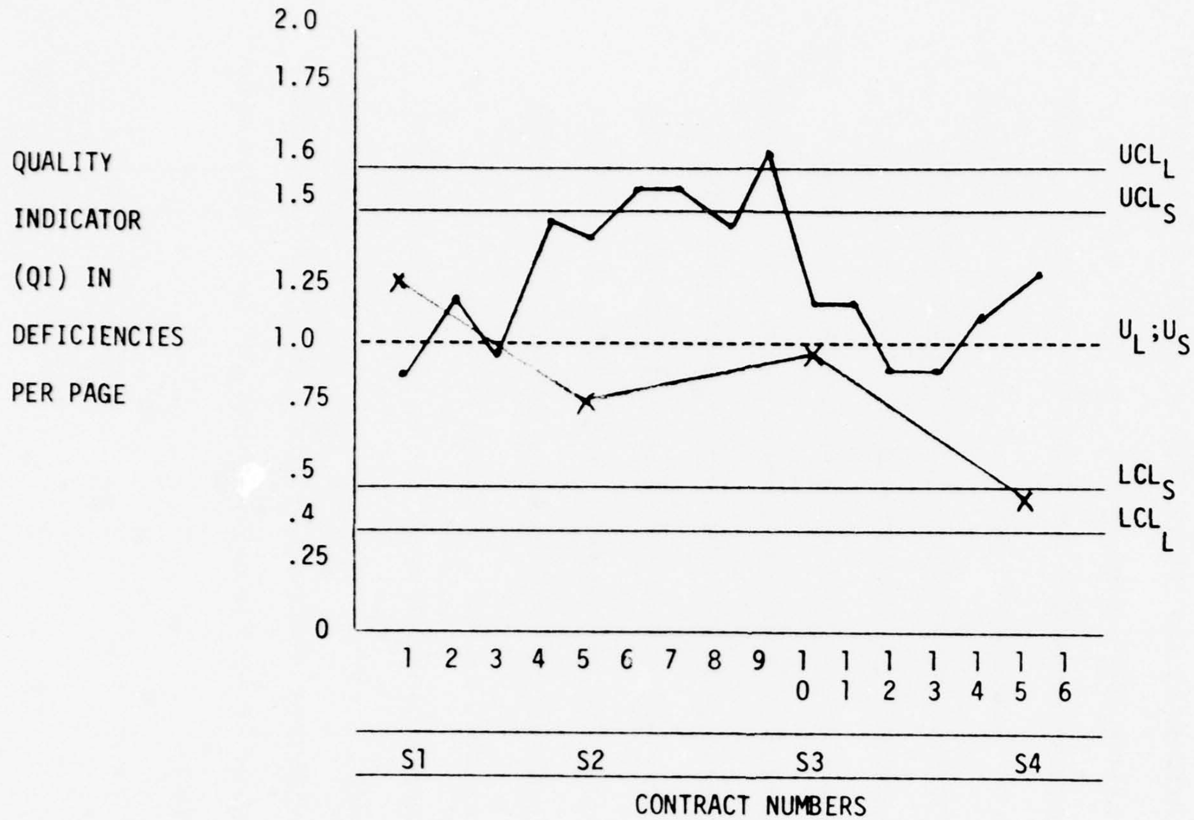


FIGURE 2. EXAMPLE CONTROL CHART FOR CONTRACT Q.I.

Periodic quality information feedback at the local level is also available and necessary. Reports which summarize quality performance are useful to inform the buying organizations how their instruments compare with other organizations. The reports also provide a convenient vehicle for disseminating recent policy developments affecting instrument quality and discussing quality performance and lessons learned at the other commodity commands regarding quality improvement.

The quality information available for submission to the HQ, DARCOM level includes the following fourteen variables:

NLC - the number of large dollar value contracts reviewed

QLC - the average QI for the large dollar value contracts

NSC - the number of small dollar value contracts prepared for award

QSC - the average QI of the small dollar value contracts reviewed

SFC - the percentage of NSC that were reviewed before award

NLS - the number of large dollar value solicitations reviewed

QLS - the average QI for the large dollar value solicitations

NSS - the number of small dollar value solicitations prepared for issuance

QSS - the average QI of the small dollar value solicitations reviewed

SFS - the percentage of NSS that were reviewed before issuance

LCP - the number of out-of-control points for large dollar value contracts

SCP - the number of out-of-control points for small dollar value contracts

LSP - the number of out-of-control points for large dollar value solicitations

SSP - the number of out-of-control points for small dollar value solicitations

Since contracts and solicitations do not appear to be statistically similar enough, a separation into two groups was necessary. This doubled the number of variables used to calculate the PI. A value for each of these variables is submitted to HQ, DARCOM by each commodity command at the end of each reporting period.

B. QISPI OPERATION AT HQ, DARCOM

1. Performance Indicator.

From the quality data submitted by the commodity commands, an action officer (AO) at HQ, DARCOM calculates the performance indicator (PI) for each using equation (6).

$$PI = \frac{(NLC)(\frac{QLC}{PFC} - QLC) + (NSC)(\frac{QSC}{PFC} - QSC \cdot SFC) + (NLS)(\frac{QLS}{PFS} - QLS) + (NSS)(\frac{QSS}{PFS} - QSS \cdot SFS)}{NLC + NSC + NLS + NSS} \qquad (6)$$

where:

PI is the performance indicator in deficiencies/page,

PFC is the review board proficiency factor for contracts,

PFS is the review board proficiency factor for solicitations for each command, and the other variables are as defined previously.

In order for the QISPI to function properly, it is critical that the review boards conduct a thorough and consistent review. The degree to which this is accomplished is reflected in the proficiency factors. The method proposed to establish and maintain reasonable estimates of their value for each command is through periodic, independent reviews by some organization such as the DARCOM Procurement Management Review (PMR) organization. PMR would periodically update the proficiency factors through an independent review on a sampling basis after the board review. This independent review would tend to "keep the boards honest."

Once the PI values are calculated, they are weighted by the applicable number of instruments for each command and averaged for the DARCOM PI measurement using equation (7).

$$PI_D = \frac{\sum_{i=1}^{m} (PI_i)(N_i)}{\sum_{i=1}^{m} N_i} \qquad (7)$$

where:

PI_D is the DARCOM Performance Indicator

N_i is the total number of instruments processed by the respective commands during the reporting period; (i.e., NLC+NSC+NLS+NSS)

m is the number of commodity commands reporting.

2. Management Information.

The DARCOM AO prepares one summary report for presentation during program review. This routine report shows the performance variables submitted by the commands and the calculated PIs for comparison with previously established targets. The report also contains any narrative required to explain achieved performance. Figure 3 illustrates one possible viewgraph format for the PI summary report.

The targets to be achieved should be developed from actual instrument quality data from the commodity commands. It is not necessary that the targets be the same for all commands but they must be realistic. Each command should strive to attain its target and be judged accordingly. Between command comparisons should be avoided.

Feedback to the commodity command from DARCOM HQ could be provided by using a monthly or quarterly Procurement Information Newsletter. Such a newsletter would summarize recent policy developments affecting document quality and discuss quality performance and lessons learned at the MSCs regarding quality improvement.

3. Performance Analysis.

The DARCOM AO compares the calculated PIs with the previously established targets to determine if the quality level at the commands is acceptable. If the PI values are at or below the targets and the number of out-of-control points is not excessive, it can be concluded that the DARCOM procurement instruments are at an acceptable quality level. There is

US ARMY MATERIEL DEVELOPMENT AND READINESS COMMAND

QUARTERLY SUMMARY OF PROCUREMENT INSTRUMENT QUALITY

FOR______ QTR FY_____

MAJOR SUBORDINATE COMMAND	TYPE OF DOCUMENT	TYPE OF REVIEW	AVERAGE DEFICIENCIES PER PAGE	NO. OF DOCUMENTS REVIEWED	NO. OF DOC'S EXCEEDING CONTROL LIMITS
ARMCOM	Sol'n	100%	QLS=	NLS=	LSP =
T_1 =		Sampled	QSS=	NSS=	SSP =
PI_1 =	Contract	100%	QLC=	NLC=	LCP =
		Sampled	QSC=	NSC=	SCP =
AVSCOM	"	"	"	"	"
T_2 =		"	"	"	"
PI_3 =	"				
ECOM	"				
T_3 =					
PI_3 =					
MICOM					
T_4 =					
PI_4 =					
TACOM					
T_5 =					
PI_5 =					
TECOM					
T_6 =					
PI_6 =					
DARCOM T = PI =					

FIGURE 3. Viewgraph Format for PI Summary Report

no need for additional analysis except in the case that a particular commodity command is showing exceptional quality. It may be that something can be learned from them and applied to the other commands.

If the calculations show missed targets, especially consistently or substantially, or an excessive number of out-of-control points, further investigation is needed to determine the causes. Are the targets unrealistic? Has personnel turbulance been a contributing factor? Can the problem be traced to a particular procurement group or is it omnipresent? Most of these kinds of questions must be answered by the commands themselves to the satisfaction of the DARCOM action officer.

Corrective action must be taken to get the performance "back on track" once the causes are identified. This corrective action is primarily the responsibility of the individual commands. Investigation into the other indirect quality indicators listed in Chapter II may provide additional insight into why the problem exists or whether or not it truly is a problem.

Before the QISPI can be implemented in DARCOM, a few remaining questions must be answered satisfactorily regarding actual deficiency rates, performance targets, and system applicability. The system tests described in Chapter IV attempt to answer these questions.

CHAPTER IV

QUALITY IMPROVEMENT SYSTEM TEST

Two different approaches are being taken to test the QISPI as designed in Chapter II: (1) computer simulation and (2) test application at two commodity commands. The system simulation is complete; the test applications are still progressing with a planned completion date of December 1976.

The primary purpose of both approaches is to test whether or not the assumptions made to develop the system are reasonable considering the operating environment at the commodity commands. If the assumptions prove to be reasonable, procurement management can implement the system and be confident that it is based upon sound statistical principles. If the assumptions prove to be unreasonable, modifications must be made to the system to overcome the shortcomings before implementation. If the operating environment will not permit the application of this system, it should be discarded in favor of some alternative approach.

Another reason for the tests is to establish realistic targets for the commodity commands to strive for. The tests should provide reasonable starting points for each command. As the respective quality levels improve over time, targets may need to be adjusted accordingly.

A third reason for the test applications is to answer procedural questions such as where in the procurement process should the reviews be made, exactly how should they be done, how much time should be allowed for each, and what should the sampling factor be for the smaller dollar value instruments? Answers to these questions and others will permit a smoother system implementation.

A brief description of both test approaches follows.

A. COMPUTER SIMULATION

1. Quality Indicator.

A computer program was written which simulated procurement instruments with random numbers of pages and random deficiencies on each page. A QI was calculated for each instrument using equation (2) with assumed values for each parameter. The values for the parameters were varied to determine how sensitive the QI is to each and what the range of validity is for the system assumptions. All of the assumed values in this chapter are based upon actual procurement instrument data from two DARCOM commodity commands and one Air Force Logistics Center. Adjustments have been made where good judgement dictated.

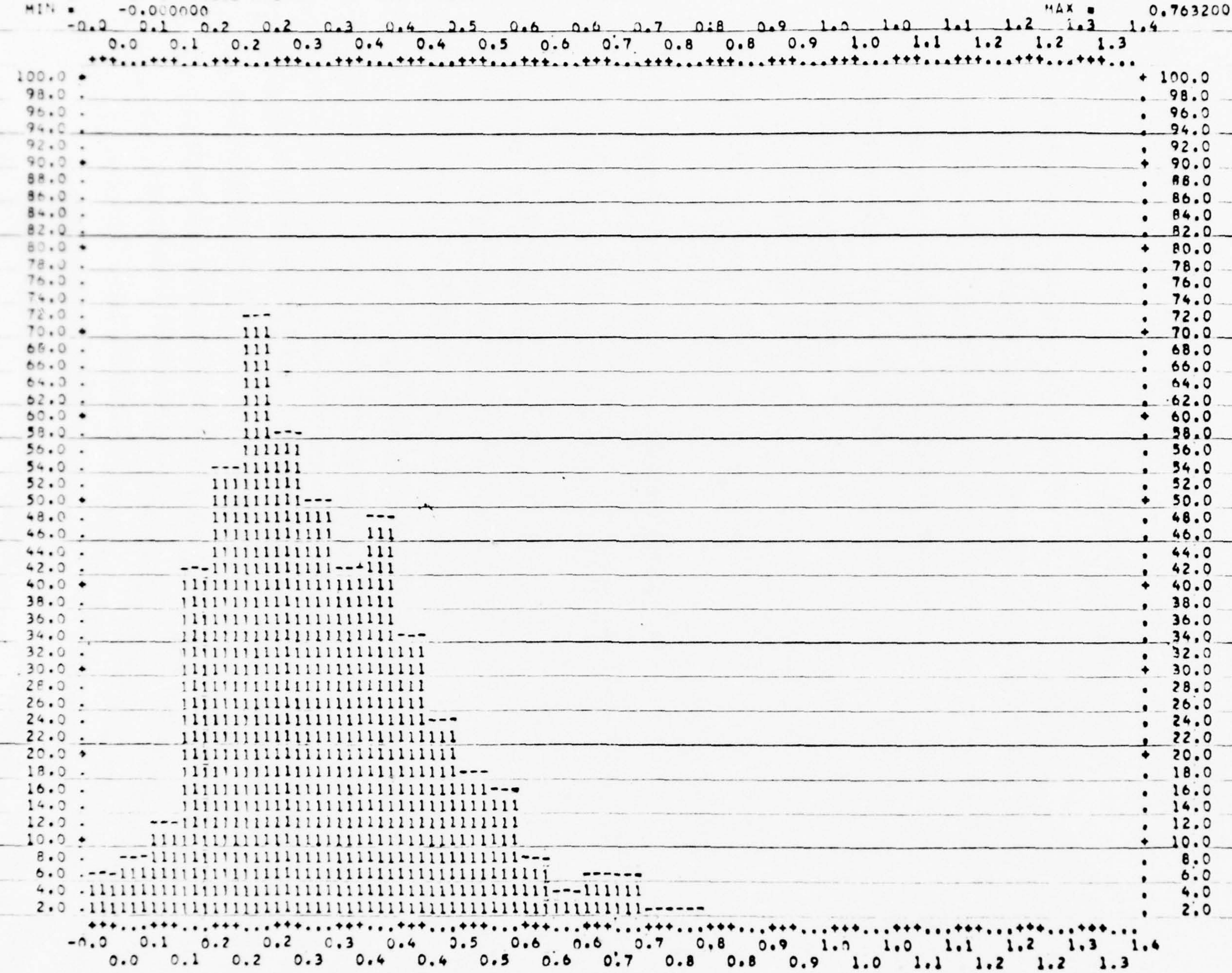
The frequency distribution plotted on Graph 1 for 500 instruments is representative of the QIs that result from the calculations using the current best estimates of the equation (2) values. Page numbers were assumed to be uniformly distributed with a mean of 60 pages and a range of 20 to 99 pages. The number of deficiencies detected on each page was assumed to follow a Poisson distribution with a mean of .05 major deficiencies per page and .10 minor deficiencies per page. The weighting constant was set equal to four. The influence of the assumed Poisson distribution is evident from the graph. Since the deficiency parameters are small and some of the sample sizes (number of document pages) are also small, this is to be expected.

GRAPH 1

FREQUENCY DISTRIBUTION OF
PROCUREMENT INSTRUMENT DEFICIENCIES PER PAGE

HISTOGRAM OF VARIABLE 1

MIN = -0.000000 MAX = 0.763200



As the deficiency parameters increase, the distribution tends more toward normality. Graph 2 illustrates this for 500 instruments with major and minor deficiency parameters equal to .10 and .20 respectively. All other values remained the same as in Graph 1.

As the deficiency parameters decrease, the Poisson influence becomes more pronounced and the distribution is well described as chi-square. This is illustrated in Graph 3 for 500 instruments with major and minor deficiency parameters equal to .005 and .01 respectively.

If the deficiency parameters are held at .05 and .10 respectively and the number of instrument pages is varied, the distribution tends toward normality as the number of pages increases. Graph 4 with the number of pages equal to 20 and Graph 5 with the number of pages equal to 100 show the difference.

Graph 6 shows there is little effect of doubling the weighting constant to eight with all other values the same as in Graph 1.

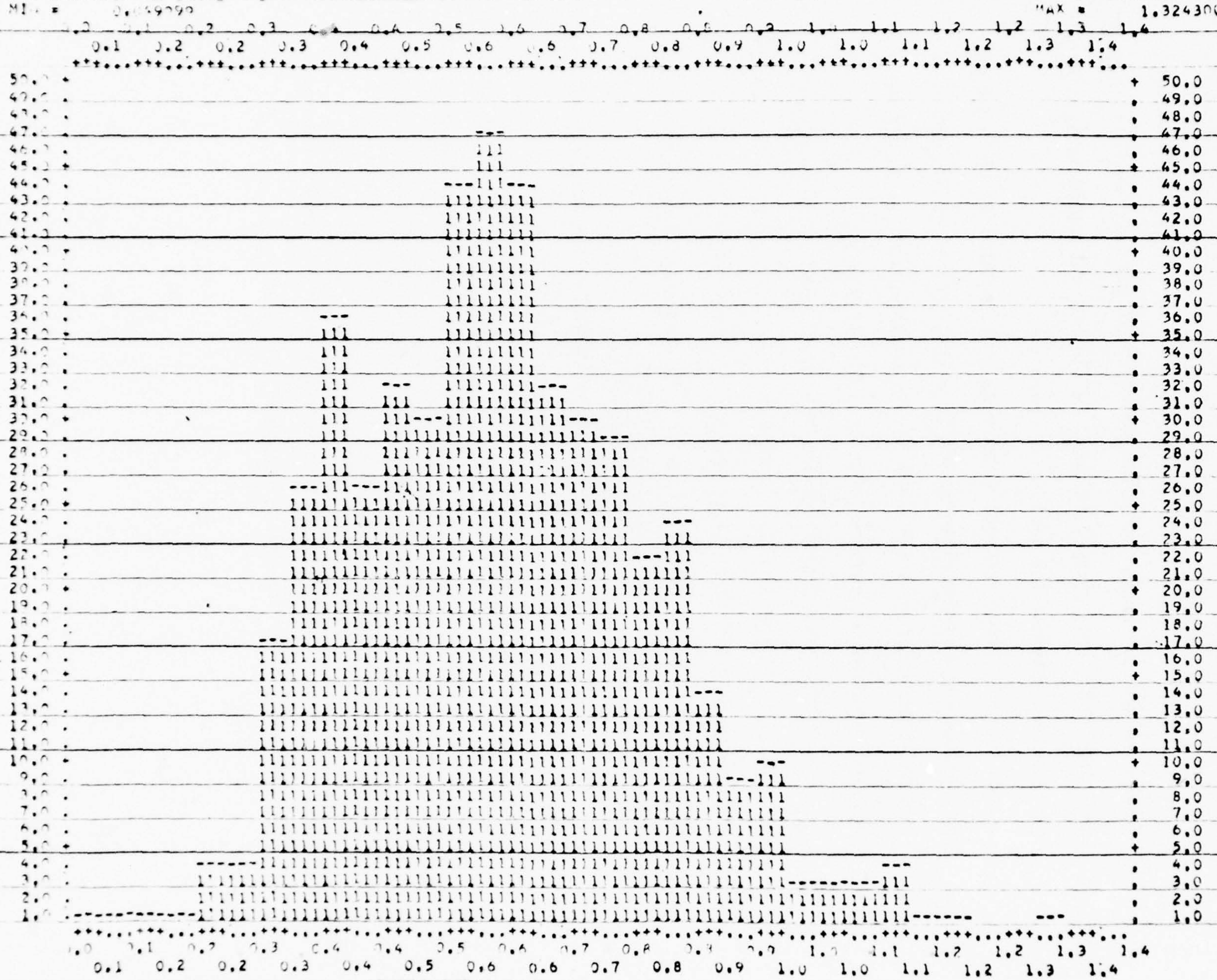
The QI mean is not affected by an increase in sample size, but the standard deviation decreases considerably. This is shown in Table 1. QIs were generated for 300 instruments in each group varying only the number of pages from the data used for Graph 1.

Goodness of fit tests for normality for each of the graphs shown are postponed until after the initial test application data is available.

GRAPH 2.

FREQUENCY DISTRIBUTION OF
PROCUREMENT INSTRUMENT DEFICIENCIES PER PAGE

HISTOGRAM OF VARIABLE 1
MIN = 0.059999 MAX = 1.324300

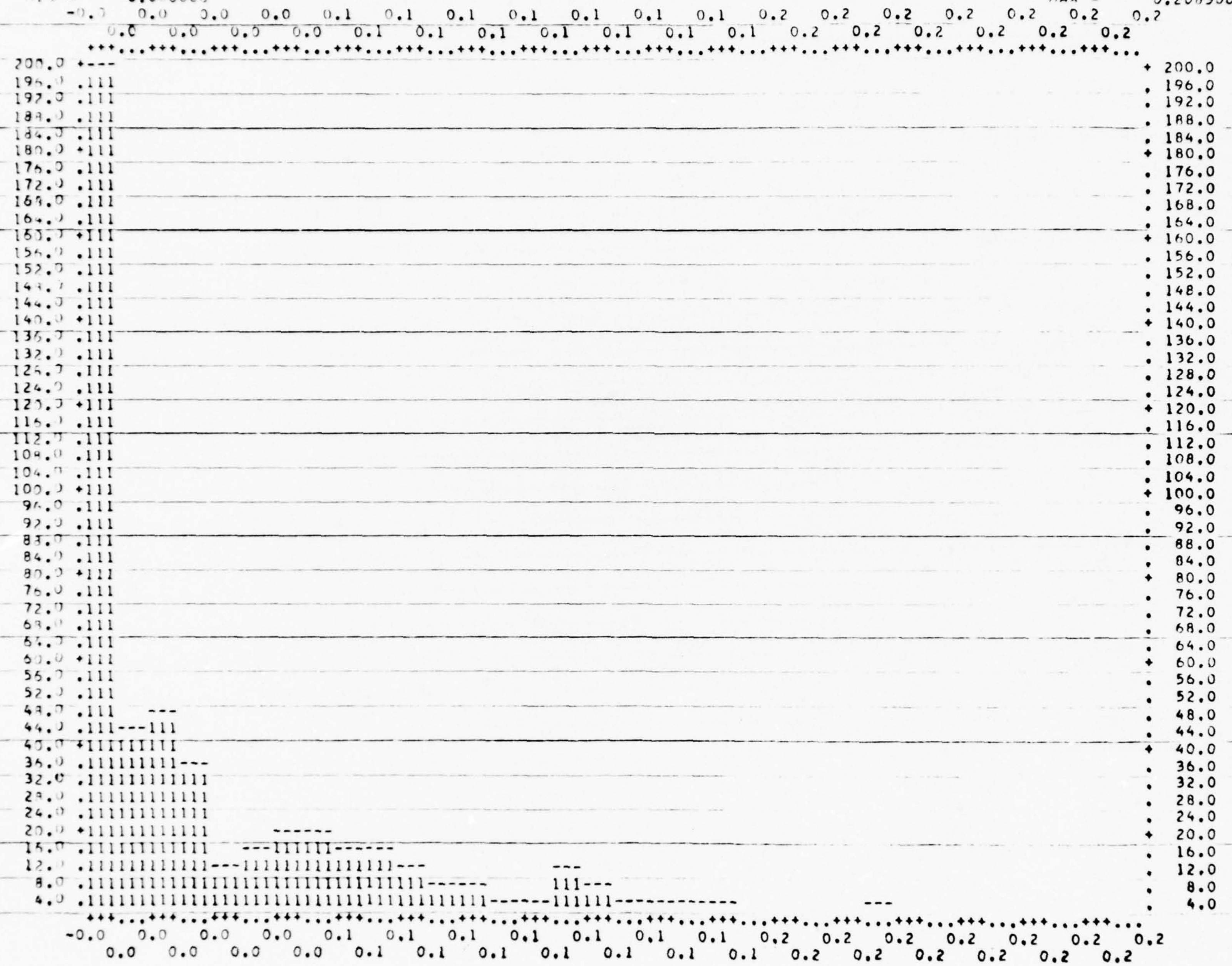


GRAPH 3.

FREQUENCY DISTRIBUTION OF
PROCUREMENT INSTRUMENT DEFICIENCIES PER PAGE

HISTOGRAM OF VARIABLE 1

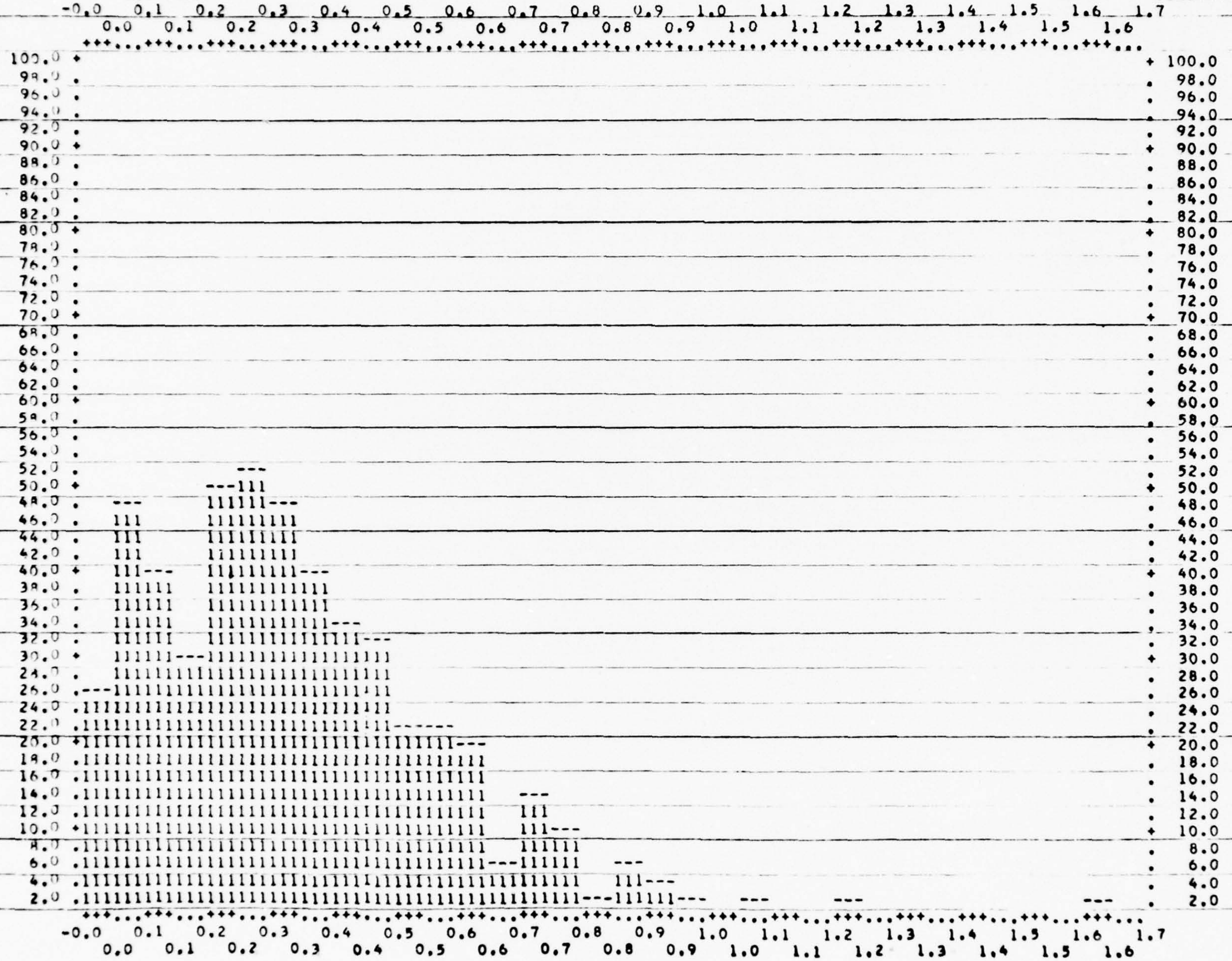
MIN = -0.000000 MAX = 0.208300



GRAPH 4.

FREQUENCY DISTRIBUTION OF
PROCUREMENT INSTRUMENT DEFICIENCIES PER PAGE

HISTOGRAM OF VARIABLE 1
MIN = -0.000000 MAX = 1.600000

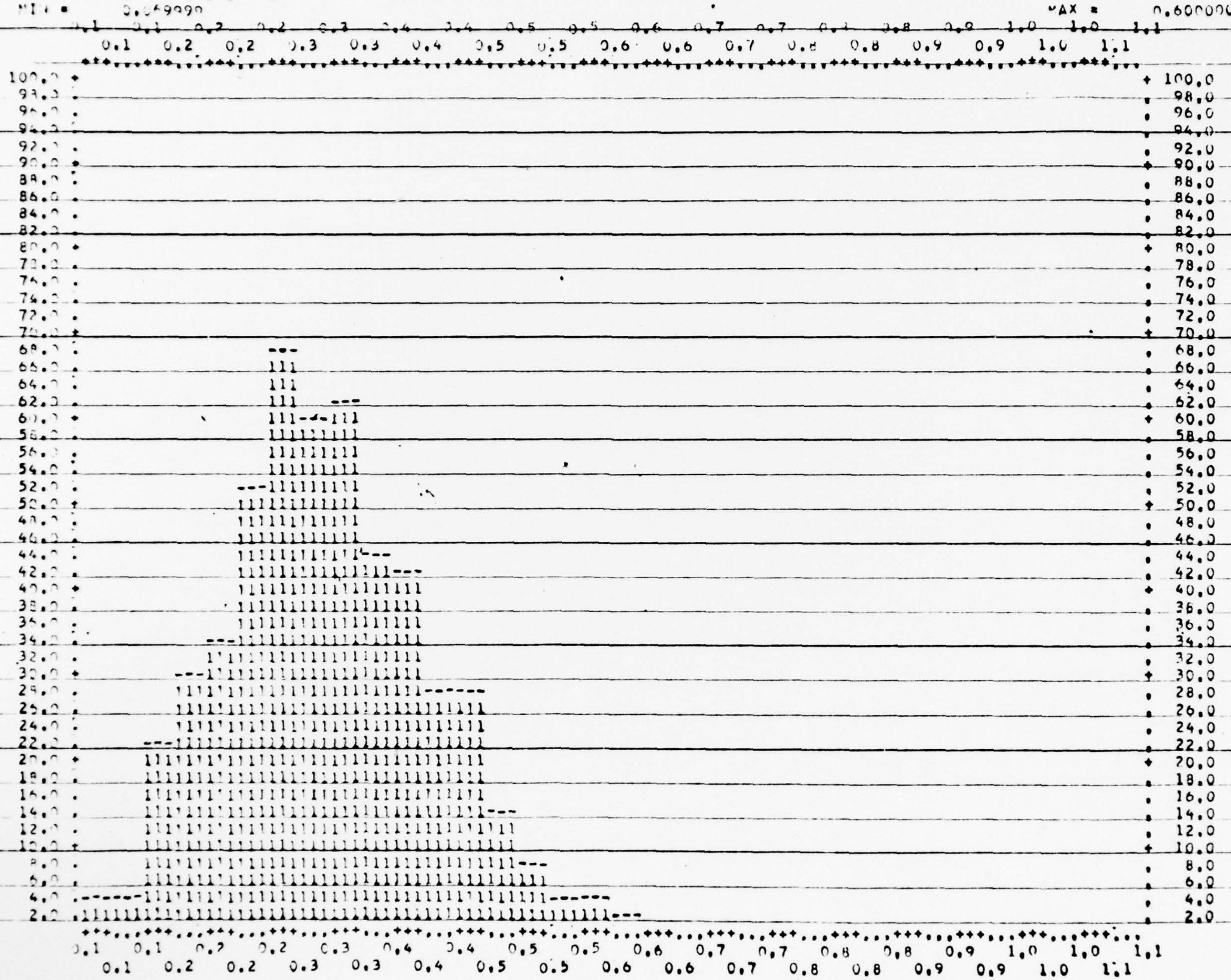


GRAPH 5.

FREQUENCY DISTRIBUTION OF
PROCUREMENT INSTRUMENT DEFICIENCIES PER PAGE

HISTOGRAM OF VARIABLE 1

MIN = 0.069999 MAX = 0.600000



GRAPH 6.

FREQUENCY DISTRIBUTION OF
PROCUREMENT INSTRUMENT DEFICIENCIES PER PAGE

HISTOGRAM OF VARIABLE 1
MIN = -0.000000 MAX = 1.450000

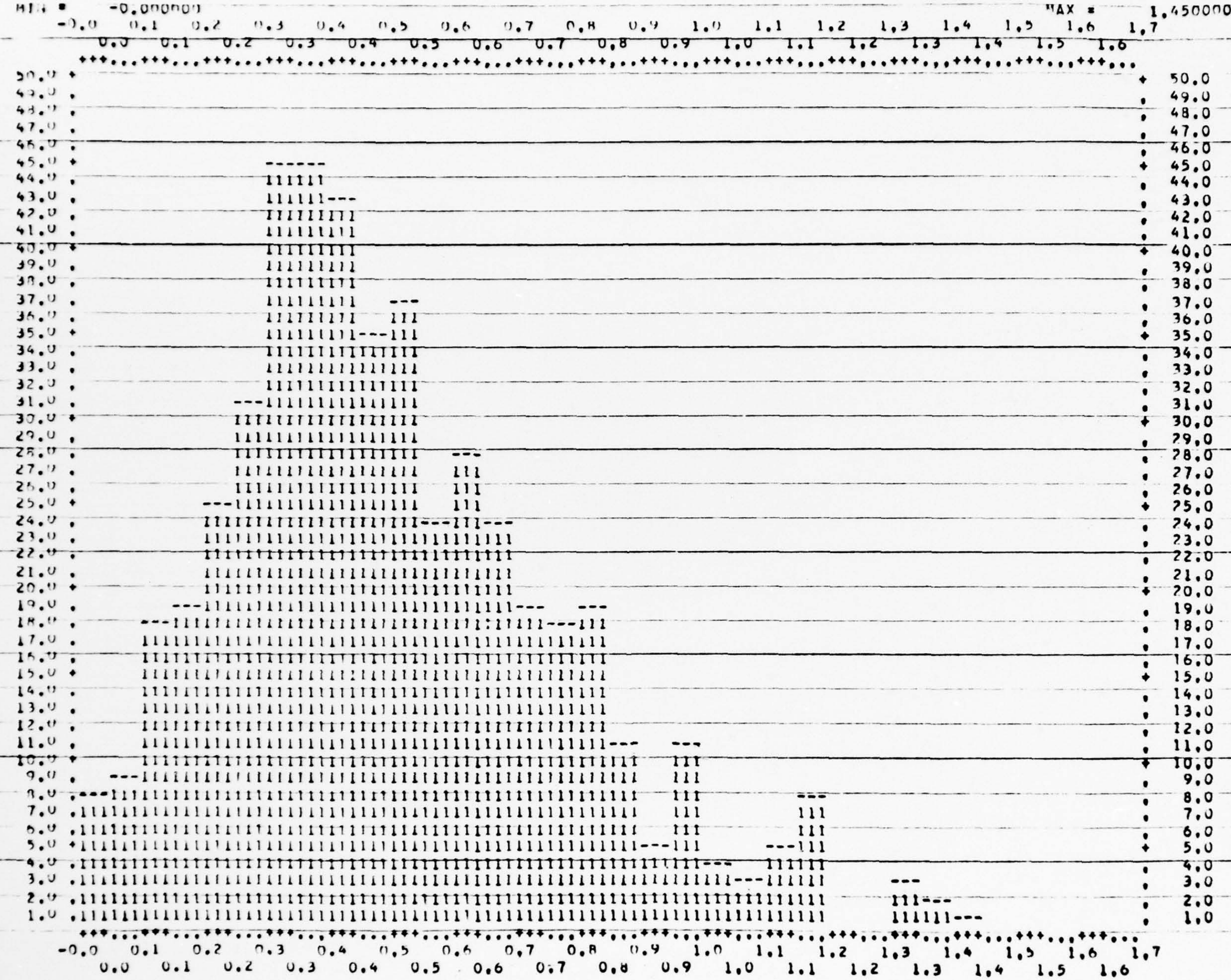


TABLE 1. SENSITIVITY OF QI TO NUMBER OF PAGES

NUMBER OF INSTRUMENT PAGES	QI MEAN	QI STANDARD DEVIATION	AVG. NO. OF MAJOR ERRORS	AVG. NO. OF MINOR ERRORS
20	0.3032	0.2144	0.99	2.09
30	0.3039	0.1718	1.50	3.13
40	0.2962	0.1445	1.95	4.05
50	0.3031	0.1331	2.54	4.99
60	0.3116	0.1187	3.17	6.03
70	0.2946	0.1105	3.48	6.71
80	0.2985	0.1019	3.97	8.01
90	0.2948	0.0966	4.37	9.06
100	0.3043	0.0910	5.07	10.16
110	0.2965	0.0888	5.39	11.07
120	0.3063	0.0872	6.12	12.29

2. Performance Indicator.

The performance indicator (PI) in this system is a measure of the number of errors remaining in the instruments after preparation and review. It is a weighted average of QIs adjusted for review board proficiency and sampling percentages. Table 2 gives the results of simulating an average commodity command's activity for one year using equation (5) as the expression for PI.

TABLE 2. SIMULATED PI VALUES

MONTH	PERFORMANCE INDICATOR (PI)	NO. OF LARGE CONTRACTS (NLC)	QI FOR LARGE CONTRACTS (QLC)	NO. OF SMALL CONTRACTS (NSC)	QI FOR SMALL CONTRACTS (QSC)
1	.1524	100	.2885	100	.2995
2	.1438	100	.2832	100	.2812
3	.1477	100	.2998	100	.2876
4	.1475	100	.2968	100	.2876
5	.1382	100	.2905	100	.2680
6	.1442	100	.3055	100	.2792
7	.1478	100	.3087	100	.2869
8	.1412	100	.3001	100	.2734
9	.1500	100	.3105	100	.2915
10	.1489	100	.2993	100	.2903
11	.1520	100	.2976	100	.2974
12	.1558	100	.2879	100	.3069

The proficiency factor was set equal to .90, and the sampling factor was .20. The other data was the same as used in Graph 1. The number of documents simulated are based upon estimates using data from the "Procurement Statistics" for FY 75 and 76.[9]

Since the frequency distribution for the average of many QI values is approximately normal by the Central Limit Theorem, the frequency distribution of PI is also normal with a small variance. The mean and standard deviation for the PI data in Table 2 is .1475 and .0050 respectively.

B. TEST APPLICATIONS

Two DARCOM commodity commands tested the QISPI to determine its acceptability in an actual operating environment. During the test period they reviewed as many contracts and solicitations as their resources permitted using the procedure outlined in Chapter III. These test applications should answer most of the remaining questions regarding QISPI development and identify where modifications are required. Since one command uses a permanent, full-time review board and the other uses an ad hoc board, the test should provide a better understanding of the system's applicability under either approach.

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[9] "Procurement Statistics". Procurement Statistics Office, HQDA (DAMA-ISP), Washington, DC 20310. Fiscal years 75 and 76.

CHAPTER V

CONCLUSION

The QISPI, as developed and tested to date, has considerable potential as a tool for DARCOM procurement managers to control the quality of their procurement instruments. When implemented, it should provide the meaningful management information on document quality that is presently lacking in DARCOM. Without such information, instrument quality control and improvement is at best haphazard.

The simulation tests have shown that the mathematical structure of the QISPI is feasible. The results of the test applications at two commodity commands will be evaluated to determine the appropriateness and utility of the system in an operating environment. Until the system test results are evaluated and the remaining questions are answered satisfactorily, recommendations regarding system implementation will not be made.

This report has been published to present the currently designed system to potential users and to provoke them into thinking more about the subject of procurement instrument quality. A final report will be published following the system tests. The report will present the test results and any required system modifications as well as recommendations for implementation throughout DARCOM.

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APPENDIX A

DEFINITION OF MAJOR/MINOR ERRORS

SECTION A

1. Type of Contract/Modification/Solicitation/Amendment

A.	Inappropriate type of contract	Major
B.	Code Incorrect	Minor

2. Contract/Modification/Solicitation/Amendment Number

A.	Number omitted	Minor
B.	Incorrect number	Minor

3. Issuing, Administrative, Paying Offices

A.	Information omitted	Minor
B.	Incorrect information	Minor
C.	Incorrect code	Minor

4. Delivery, Discount and Invoice Information

A.	Delivery/FOB Point omitted	Major
B.	Delivery/FOB Point incorrect	Major
C.	Discount omitted or incorrect (If no discount offered by Contractor, ommission of "none" or "N/A" is not an error)	Major
D.	Omission of place for submission of invoices	Minor

5. Contractor's Name and Address

A.	Incorrect Contractor	Major
B.	Address incorrect	Major
C.	Incorrect code	Minor

6. Ship To/ Mark For

A.	Incorrect destination or destination omitted	Major
B.	MILSTRIP Data not consistent with that provided to the Contract Specialist or omitted	Minor
C.	Mark For information omitted or incorrect	Minor

7. Accounting and Appropriation Data

A.	Adequate certified funds not available	Major
B.	Accounting and Appropriation data cited incorrectly	Major
C.	Accounting and Appropriation data omitted	Major

8. Contract/Modification Amount (Also Section E)

A.	Contract price (unit and total, if applicable) omitted	Major
B.	Amount cited not consistent with the negotiated agreement or competitive price	Major
C.	Insufficient justification for contract amount	Major

9. Negotiation Authority

A.	Authority cited incorrectly	Minor
B.	No negotiation authority, if required	Major
C.	Negotiation authority not appropriate or insufficient justification for its use	Major

10. Other Section A Elements

A.	If sole source, omission of sole source justification or NCPSA and proper signatures/approvals	Major
B.	Omission of Small Business review	Major
C.	Omission of DO/DX Rating	Minor

SECTION B

11. Certifications and Representations

A.	Required certification and Representation omitted	Minor
B.	Clause not in the latest form required by ASPR or other regulations	Minor
C.	Inappropriate provision included	Minor

12. Contractor's Submission of Certifications and Representations

A.	Certification and Representation not completed	Minor

SECTION C

13. Instructions, Conditions, Notices

A.	Omission of pertinent information	Minor
B.	Inclusion of inappropriate information	Minor
C.	Ambiguous information	Minor

SECTION D

14. Evaluation Factors

A.	Pertinent factors omitted (i.e. discount, Government Production and Research Property, F.A. testing, transportation)	Major

15. Factors other than price

A.	Pertinent factors omitted	Major
B.	Relative order of importance omitted or incorrect	Major
C.	Factors not consistent with Evaluation Plan	Major
D.	Evaluation weight set forth in contract	Minor

16. Other Section D Elements

<u>SECTION E</u>

17. Line and Subline Item Number

A.	CLIN/SUBCLIN (number) omitted	Minor
B.	CLIN/SUBCLIN (number) incorrectly identified	Minor

18. Nomenclature, NSN, Part Number, Quantity

A.	Omission of data	Major
B.	Incorrect Nomenclature	Major
C.	Incorrect NSN or Part Number	Major
D.	Incorrect Quantity	Major

19. Other Section E Elements

<u>SECTION F</u>

20. Description and Specifications including Revisions and Dates

A.	Description or Spec omitted	Major
B.	Revision/date omitted or unidentified	Major
C.	Incorrect description, specification, or revisions	Major

21. Brand Name or Equal Statement

A.	Statement omitted	Major
B.	Statement incorrect	Major

22. Other Section F Elements

<u>SECTION G</u>

23. Preservation, Packaging, Packing, Marking

A.	Information omitted or incorrect	Major

SECTION H

24. Delivery or Performance Date

A.	Information omitted or incorrect	Major
B.	Place and method of delivery, if FOB destination	Major
C.	Place and method of delivery, if FOB origin	Minor

SECTION I

25. Inspection and Acceptance Requirements

A.	Inspection and Acceptance point omitted or incorrect	Major

26. Other Inspection or Acceptance Requirements (i.e. Fly-to-Buy) omitted or incorrect — Major

SECTION J

27. Special Provisions

A.	Option, EPA, Incentive arrangement, F.A. approval, Warranty Clause, GFP and approvals, DTC, Award Fee Provisions omitted, incorrect or ambiguous	Major
B.	Special Provisions ambiguous or inappropriate or proper approvals not obtained	Major
C.	Technical liaison clause omitted or incorrect	Minor
D.	Other Special Provisions	

SECTION K

28. Paying and ACO Instructions Including PCO Information — Minor

A.	Information omitted or incorrect	

29. Other Section K Elements — Minor

SECTION L

30. Required General Provisions

A.	Provision omitted or not current	Major

31. Additional Applicable General Provisions

A.	Provision omitted or not current	Major

32. Appropriate Alteration to General Provisions

A.	Alteration omitted or incorrect	Major

SECTION [illegible]

33. List of all Documents, Exhibits, Attachments

- A. If document, exhibits, attachments omitted but elsewhere incorporated — Minor
- B. If omitted and not incorporated elsewhere in contract — Major

[illegible]. Form Number, Name, Date, Number of Pages

- A. Omission of information — Minor
- B. Incorrect information — Minor

APPENDIX B

STUDY TEAM COMPOSITION

Monte G. Norton, (Project Officer) Industrial Engineer, US Army Procurement Research Office, ALMC. B.S. Industrial Engineering, North Dakota State University, 1969; M.E. Industrial Engineering, Texas A&M University, 1970. Prior to joining Army Procurement Research Office, Mr. Norton was an Operations Research Analyst with the Defense Logistics Studies Information Exchnage (DLSIE). Before that, Mr. Norton was a General Engineer with the Safeguard System Command, Alabama and has been a Government subcontractor.

Frederick W. Helwig, Procurement Analyst, US Army Procurement Research Office, ALMC. B.A. in Economics, University of South Florida, 1963; Master of Commercial Science, Rollins College, 1970. Prior to joining the US Army Procurement Research Office, Mr. Helwig was a Contract Negotiator (R&D and Production Contracts) with the Navy. He also has had similar procurement experience as a Procurement Officer and Contract Negotiator with the Air Force.

Edward T. Lovett, Procurement Analyst, US Army Procurement Research Office, ALMC. B.A. in Psychology, .illanova University 1969; M.S. in Contract and Procurement Management, Florida Institute of Technology, 1974. Prior to joining the US Army Procurement Research Office, Mr. Lovett was a Logistics Management Specialist with the Directorate for Requirements and Procurement, HQ DARCOM and a Contract Assistant with the US Army Electronics Command at Ft Monmouth.

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13. ABSTRACT

The Quality Improvement System for Procurement Instruments (QISPI) as presented in this report has considerable potential as a tool for procurement managers to control the quality of their instruments. Document quality measurement and control begins with a quality indicator (QI) calculation based upon the number and type of instrument deficiencies per page. Standard control charts are used to determine document acceptability and track quality levels at the commodity commands. The QI values from each command are adjusted at the HQ DARCOM level to reflect review board proficiency and sampling percentages which results in the final performance indicator (PI) calculation for all of DARCOM. System test results from tests conducted at selected major procurement activities of DARCOM will be carefully evaluated during and after the test to confirm the appropriateness and utility of the system and to make any necessary improvements. Recommendations regarding QISPI implementation are postponed until the tests are completed. (U)

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